Entry into service of a power plant operation from Renewable Energy Sources- Institutional Framework

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I hereby declare that the work submitted is mine and that where I have made use of another's work, I have attributed the source(s) according to the Regulations set in the Student's Handbook.

February 2019

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ABSTRACT

This dissertation was written as part of the LL.M. in Transnational and European Commercial Law, Mediation, Arbitration and Energy Law at the International Hellenic University.

In this dissertation, a report of the European and Greek policy concerning the promotion of Renewable Energy Sources on electricity sector takes place. This dissertation attempts to answer on the basic question of whether the targets, policies and strategies that set European Union contribute to the objective of attracting investments on the sector of electricity by Renewable Energy Sources (RES). In addition, the basic and most important part of this dissertation is the application of European policy through Directives, proposals, Action Plans and Communications into the Greek legal framework and the formation of institutional framework concerning the entry into service of RES power plants.

At the first part, it is analyzed the reason of promotion and use of renewable energy sources on electricity generation by European Union as a connection between introduction and second part. At the second part, they are presented all the forms of renewable energy sources that are used broader in electricity generation. At the third part, a presentation of the progress of European institutional framework concerning the promotion of RES in electricity sector and the authorisation procedure for entry into service of RES power plants, take place. Finally, at the fourth part, it is presented the progress of Greek institutional framework and the Council of State's case law concerning the licensing of RES power plants.

Key words: Renewable Energy Sources, Electricity, Environment, Investments

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1. INTRODUCTION

The electricity sector is one of the most important elements that contribute to the development of the worldwide economy. This means that without electricity, the worldwide industry for the production of goods and offer of services would be collapsed and at the same time, the society and its citizen would not be able to live gracefully and would not be developed at this fast rate that developed until now.

However, the generation of electricity was so harmful against the environment, because for the generation of electricity was used conventional energy sources, such as carbon. In addition to this harmful impact against the environment, these conventional energy sources are not inexhaustible and for this reason arose the very crucial question of energy supply. These serious problems arose the need for use of energy sources friendly to the environment and practically inexhaustible, namely the Renewable Energy Sources (RES).

At this point, the European Union (EU) started to apply a policy on the promotion of renewable energy sources, such as the wind power, the solar power, the bioenergy, small hydropower, ocean energy and geothermal electricity. This attempt was difficult, ongoing and organized from the start until now. The protection of environment through the promotion of renewable energy sources proclaimed as the main target of EU. EU proceeded to this promotion through the promotion of a common policy with common minimum targets for all European countries and for this reason the European legislation was extensive.

The progress of institutional framework for entry into service of power plants from RES came through many difficulties. At first, the administration and licensing procedures of these power plants were complicated and very time-consuming and for this reason the first attempt by the EU at a first stage and by the European countries at a second stage, was unsuccessful. However, EU continued to try with many Directives, Regulations, researches, proposals, Action Plans and Communications that led to the current Union legislation concerning the EU environmental targets, the promotion of RES and the licensing procedures of RES power plants.

In this dissertation, I analyze the use and exploitation of all forms of renewable energy sources for electricity generation and the progress of European and National

institutional framework for entry into service of RES power plants through Directives, Regulations and Communications that promote the use of RES on electricity generation and obligate European countries to create their Action Plans and a legal framework concerning the licensing procedure for generation, establishment and operation of RES power plants. At the same time, it will be analyzed the current National framework concerning the administration procedures for entry into service of RES power plants that has been formulated by the extensive case law of the Council of State.

The methodology of this dissertation was based on the study of primary and secondary sources of European legislation, on Directives, Regulations, researches, proposals, Action Plans, Communications of European Commission and on Greek legislation and case-law. In addition, it was so important the contribution of scientific literature and journalism, but also the data from big and official reports and researches by European Commission and European organizations.

As regards the structure of the dissertation:

- *At the first part*, it is analyzed the reason of promotion and use of renewable energy sources on electricity generation by European Union.
- *At the second part*, an analysis of the forms of renewable energy sources that are used broader in electricity generation and European statistics concerning the generation of electricity from these forms of RES and the installed capacity, will take place.
- *At the third part*, it will take place:
    a. A historical review of European legal framework concerning the promotion of RES in electricity generation via Directives, proposals, Action Plans and Communications,
    b. An analysis of the role of liberalization of the electricity market and the abolition of the monopolies to the penetration of renewable energy sources in the market and
    c. An analysis of the authorisation procedure that provided Directive 2009/28/EC (RES Directive) and Directive 2009/72/EC (Electricity Directive).

- *At the fourth part*, it will take place:
    a. A historical review of Greek legal framework concerning the harmonization of European Directives, the creation of National Action Plan setting national targets for the promotion of RES to reach to the current national legislation concerning the protection of environment and the administration and licensing procedures for entry into service of RES power plants
    b. An analysis of the National Action Plan
    c. An analysis of the licensing procedure concerning the generation of electricity, the environmental license of RES power plants and the installation and operation license of RES power plants. Furthermore, they are analyzed the Power Purchase Agreements (P.P.A.) that are concluded with the Administrators
    d. An analysis of the case law of the Council of State concerning the protection of environment that determined largely the current institutional framework for entry into service of RES power plants
- Finally, *at the fifth part*, an attempt to develop some important conclusions concerning the promotion of RES in electricity sector and the assessment of European and Greek institutional framework for entry into service of RES power plants, will take place.

2. RENEWABLE ENERGY SOURCES AND ELECTRICITY

Until the beginning of 1990s, the production and exploitation of electricity was one of the most harmful activities of energy production with the most serious environmental impact. However, the demand of electricity was been increasing more and more worldwide, due to the fact that the economies of the countries were been developing, so the most crucial element for the development of the countries was the use of any form of energy. The use of conventional energy sources was the most usual

in the production of electricity, but at the same time was the most harmful activity for the environment. Furthermore, these conventional energy sources, such as carbon, were not inexhaustible and for this reason arose the very crucial question of energy supply, as the main target of the European Union and the International Community.

This polluting impact to the environment and the increase of electricity demand arose the need for using energy sources friendly to the environment and practically inexhaustible, namely the Renewable Energy Sources (RES), such as the wind power, the solar power, the bioenergy, small hydropower, ocean energy and geothermal electricity. The exploitation of Renewable Energy Sources started from the ancient times with the exploitation of the wind through windmills, but humans have never been exploited RES for the production of energy.

The promotion of Renewable Energy Sources started with some International Agreements among all countries aiming the protection of environment setting up some specific targets such as the Kyoto Protocol and at the same time in European Level, EU proceeded to this promotion of RES through many Directives, Regulations, researches, proposals, Action Plans and Communications.

The way to the formation of the current European institutional framework applying for the generation of electricity by Renewable Energy Sources was difficult, but the steps to the evolution of energy policy and strategy are so big. Each Member-State has issued National Action Plans and National targets according to the targets that European Union set up.

The applicable institutional framework for entry into service of a power plant operation from Renewable Energy Sources has been determined by each Member-State applying some basic criteria that the European Directives set up. Target of the EU is to simplify more and more the administrative and licensing procedure for the installation of power plants and the licensing of transmission and distribution activities.

It is obvious that the exploitation of Renewable Energy Sources contributes to the two main elements of sustainable development: economy and environment. However, it is necessary to be emphasized the fact that none of the forms of energy, as

renewable and friendly to the environment as it is, has no harmful impact to the environment.

3. FORMS OF RENEWABLE ENERGY SOURCES

Wind power, hydropower, geothermal and bioenergy are the initial and main Renewable Energy Sources of electricity market, which first developed. The solar power with Photovoltaics (PV) and Concentrated Solar Power (CSP) and the ocean energy has already used worldwide duo to their cost and energy effectiveness and are being developed more and more year-to-year. These Renewable Energy Sources will be analyzed to this chapter.

3.1 Wind power

Humanity had started to exploit the wind power from the ancient times with the construction and use of sailboats and windmills. Sails were put to a vertical shaft, from which the wind could pass, causing the sails to rotate producing kinetic energy for milling grain. The evolution of the ancient sailboats and windmills is the ultra high tech wind turbines, which generate electricity[1]. Wind turbines convert the kinetic energy of the wind to mechanical energy through the rotation of the axle of the impeller, and in a second phase, the generator of a wind turbine assists to the conversion of the mechanical energy to electricity, using advanced technology, that will be analyzed below[2].

Wind power is created indirectly by solar radiation, due to the fact that the uneven heating of the earth's surface causes the movement of large masses of winds from one territory to another. This energy source is inexhaustible, friendly to the environment

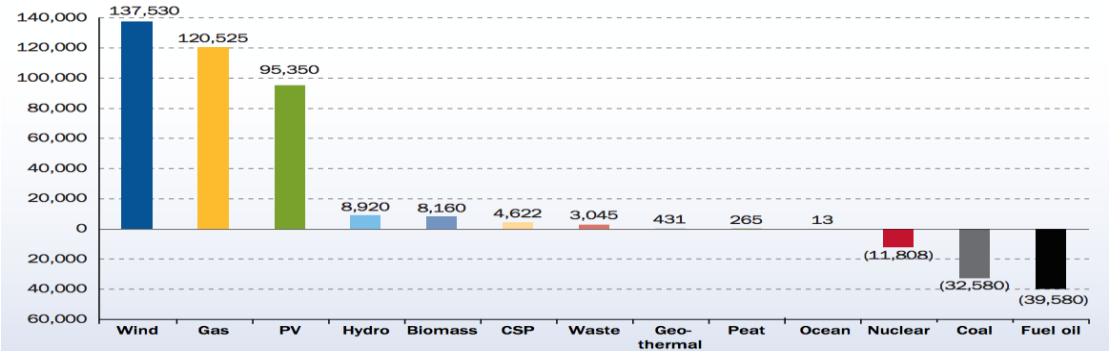
[1] European Renewable Energy Council (EREC), *Renewable Energy in Europe: markets, trends, and technologies* (first published in 2010, second edition, Earthscan 2010) p. 93

[2] Ministry of Environment & Energy, Wind Power < www.ypeka.gr/Default.aspx?tabid=287&language=el-GR > accessed in 10 December 2018

and for this reason is called renewable. For this reason, the exploitation of this renewable energy source in Europe and mainly in our country, Greece, where wind power is the most widespread renewable energy source, combined with the evolution of technology to the construction of wind turbines today, will contribute greatly to the energy sources saving, protection of the environment and tackling of climate change.

Europe has an extremely great wind resource with wind parks in a lot of countries, such as Denmark, Spain, Norway, the Netherlands, the UK, Ireland, Italy and Greece. The first wind park in Europe constructed in 1982 in a Greek island, Kithnos, where settled five wind turbines of 20 kW each. Greece has enormous wind resource in Crete, Euboea, Peloponnese and islands of the Aegean, where have constructed the most wind parks, which consist of arrays of wind turbines in the optimal layout to achieve the best possible exploitation of wind potential.

According to the European statistics of European Wind Energy Association (EWEA) of 2015, the net growth of wind power from 1995 to 2015 had come up to 137 GW, an enormous number that showed that wind power is the most widespread renewable energy source in Europe, since solar power with Photovoltaic (PV) is in the second place of this research of European Wind Energy Association (EWEA) of 2015 with a growth of 93 GW. Finally, the exploitation of wind power compared with the total power capacity has increased six times, from 2,4% in 2000 to 15,6% in 2015, an increase that shows the widespread exploitation of renewable energy sources time to time. [3]



Picture 1: Net electricity-generating installations in the EU, 1995-2015 (MW) (Source: EWEA 2015 European Statistics)

[3] The European Wind Energy Association (EWEA), *Wind in Power: 2015 European Statistics* (2016) p. 8

As mentioned above, wind turbines convert the kinetic energy of the wind to electricity in two phases. In the first phase, the kinetic energy of the wind is converted to mechanical energy through the rotation of the axle of the impeller, and in a second phase, the generator of a wind turbine assists to the conversion of the mechanical energy to electricity. The electricity, that wind turbines produce, either is consumed on the spot or is injected into the grid to be consumed elsewhere. The produced electricity, in case that production is bigger than demand, is stored to be used later, when the demand is bigger than production.

Wind turbines are divided into two basic categories:

1) *Horizontal-axis wind turbines*: This category of wind turbines has the axis of the wind turbine horizontal or parallel with the ground. Horizontal-axis wind turbines are the most widespread wind turbines in big wind applications. The big advantage of these wind turbines is that they produce more electricity in a specific amount of wind, so the disadvantage is that they have not good productivity in a case of strong winds.

Picture 2: Horizontal-axis wind turbines

2) *Vertical-axis wind turbines*: In this category of wind turbines, the axis rotates vertically to the ground. These wind turbines are primarily used in small and residential wind applications, because they cannot be settled high enough to benefit from the strong winds. Vertical-axis wind turbines have the big advantage that they powered by wind coming from all around, namely 360 degrees.

Picture 3: Vertical-axis wind turbines

3.2 Solar power

Solar power is the energy that comes from the sun. Light and heat, that are produced and irradiated by the sun, are absorbed by applications and various constructions and after this, they are converted in other forms of energy. The solar power today is absorbed and converted in other forms of energy by advanced technological means, such as photovoltaic, but it is still being used a very small percentage of the solar energy that arrives to the earth.

The last years, the solar power is used more and more for the production of electricity from country to country in the EU with the aid of a policy aiming to the promotion of Renewable Energy Sources by all countries in the world. For that reason, an intense legislative activity has been observed worldwide with particular energy programs, regulations and directives by legislative bodies.

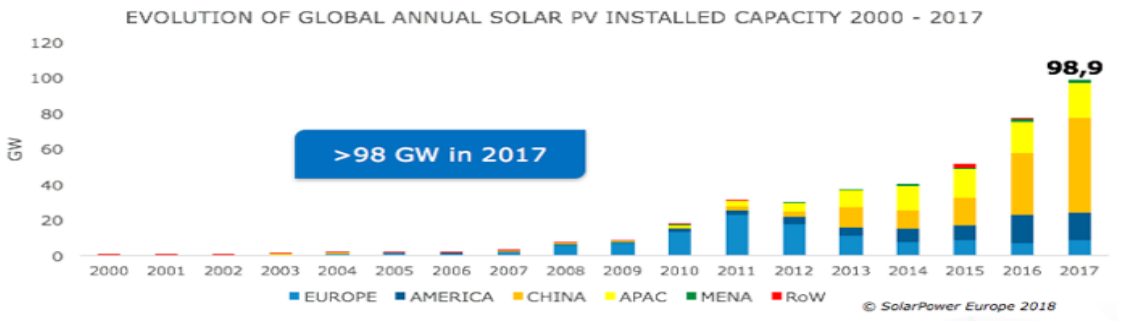
The solar power is inexhaustible, renewable and friendly for the environment. There are two ways to take advantage and exploit solar power to produce electricity: Photovoltaic (PV) and Concentrated Solar Power (C.S.P.).

3.2.1 Photovoltaic (PV)

Photovoltaic systems use cells to convert solar energy from the sun into electricity. These cells are constructed by a semi-conducting material. When the light fall over these cells creates electricity across the layers of these cells. The bigger the intensity of the light, the bigger the amount of electricity that produced. The most widespread semi-conducting material used in the construction of photovoltaic cells is silicon.

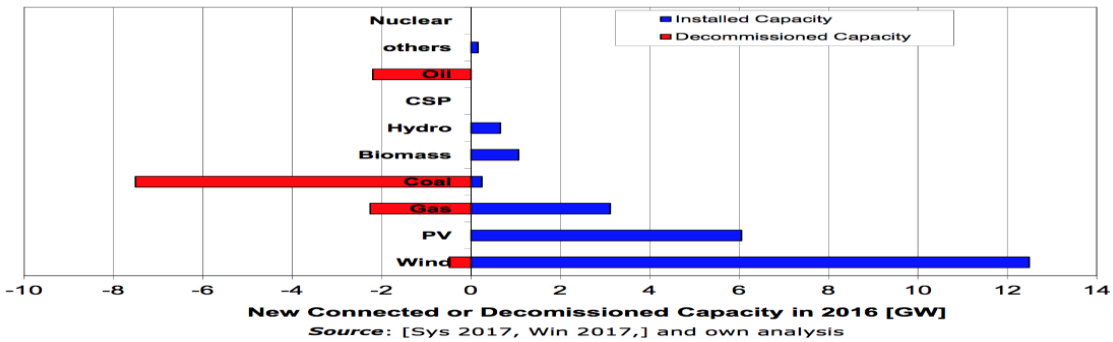
Silicon cells are constructed by thin slices from a single crystal of silicon (monocrystalline) or from a lot of silicon crystals (polycrystalline)[4].

According to European trade association "SolarPower Europe", global solar PV installations reached 98 GW from 2000 to 2017. In addition, global annual PV installed capacity increased by 29,3% in 2017.



Picture 4: Evolution of Global Annual Solar PV installed Capacity 2000-2017 (Source: SolarPower Europe)

Market conditions for PV installations differ from country to country, due to the fact that each country applies different energy policies and public programmes for the promotion of renewable energy sources, especially PV. According to the *PV Status Report 2017 of European Commission*, the new electricity generation capacity reached 23,7 GW in 2016 but 12,7 GW were decommissioned, so the new net capacity reached 11,3 GW[5].



Picture 5: New Connected or Decommissioned Capacity in 2016 (GW) (Source: PV Status Report 2017)

[4] European Renewable Energy Council (EREC), *Renewable Energy in Europe: markets, trends, and technologies* (first published in 2010, second edition, Earthscan 2010) p. 116

[5] European Commission, JRC Science for Policy Report, PV Status Report 2017 (2017), JRC <http://publications.jrc.ec.europa.eu/repository/bitstream/JRC108105/kjna28817enn.pdf > accessed 14 December 2018

Depending on the use of produced electricity, PV systems are divided into:

- **Grid-connected domestic systems:** This is the most widespread type of solar PV systems, which are installed on homes and businesses for self-production of electricity **(autonomous systems)** and the excess produced power can be fed to the electricity grid and sold to the utility **(interconnected systems)**.
- **Grid-connected power plants:** These power plants are often installed on large industrial buildings, such as airports, and can produce from hundred kW to several MW[6]**.**

3.2.2 Concentrated Solar Power (C.S.P.)

Concentrated Solar Power (C.S.P.) systems produce electricity by concentrating solar radiation to heat a medium, which is then used in an engine to drive an electrical generator[7]. These technologies could produce big amounts of power that range from 10kW to 300MW[8]. In Europe, the produced electricity by C.S.P. is calculated that reaches 1500 TWh/year, from which Mediterranean countries produce the largest amount due to the fact that they have the highest potential to solar radiation[9]. There are four C.S.P. systems to produce electricity from concentrated solar power:

a) *Parabolic trough plants*: These technologies use lines of parabolic reflectors, which concentrate and reflect the solar radiation in an absorber tube. Parabolic trough plants are the most widespread thermal electricity technology in the energy market[10].

[6] European Renewable Energy Council (EREC), *Renewable Energy in Europe: markets, trends, and technologies* (first published in 2010, second edition, Earthscan 2010) pp. 119-120

[7] European Commission, Smart Specialisation Platform, *Concentrated Solar Power* <http://s3platform.jrc.ec.europa.eu/concentrated-solar-power > accessed 16 December 2018

[8] European Renewable Energy Council (EREC), *Renewable Energy in Europe: markets, trends, and technologies* (first published in 2010, second edition, Earthscan 2010) p. 140

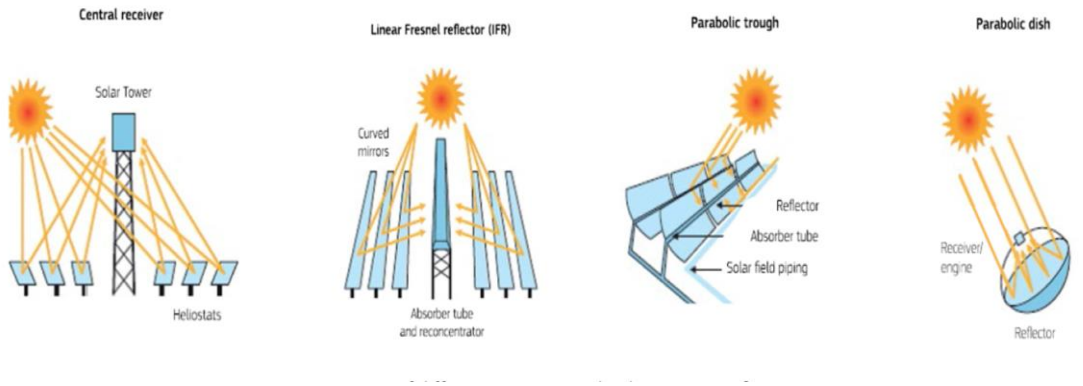
[9] European Commission, Smart Specialisation Platform, *Concentrated Solar Power* <http://s3platform.jrc.ec.europa.eu/concentrated-solar-power > accessed 16 December 2018

[10] European Renewable Energy Council (EREC), *Renewable Energy in Europe: markets, trends, and technologies* (first published in 2010, second edition, Earthscan 2010) p. 141

b) *Central receiver plants*: These plants use huge mirrors that could reach 100 m^2 (heliostats), which track the sun and reflect its solar radiation on the top of a central tower, whose temperature can reach 1000 ^oC[11].

c) *Dish-Stirling systems*: This technology uses a dish construction that concentrates solar radiation and consists of curved glass mirror. This dish construction tracks the sun and concentrates the solar radiation in an absorber tube of a Stirling engine[12].

d) *Linear Fresnel Systems*: These systems use similar lines of parabolic reflectors and similar technology producing electricity like parabolic trough plants. The difference is the fixed position of the absorber tube[13].



Picture 6: Concentrated Solar Power (C.S.P.) Systems (Source: European Commission, Smart Specialisation Platform, 'Concentrated Solar Power')

3.3 Bioenergy

Electricity can be produced from biomass using several conversion techniques, such as chemical, thermal or biological processes. According to Article 2(b) of Directive 2001/77/EC, "biomass shall mean the biodegradable fraction of products, waste and residues from agriculture (including vegetal and animal substances), forestry and related industries, as well as the biodegradable fraction of industrial and municipal

[11] European Commission, Smart Specialisation Platform, *Concentrated Solar Power* <http://s3platform.jrc.ec.europa.eu/concentrated-solar-power > accessed 16 December 2018

[12] European Renewable Energy Council (EREC), *Renewable Energy in Europe: markets, trends, and technologies* (first published in 2010, second edition, Earthscan 2010) pp. 144-145

[13] idim p.145

waste". Biomass is a result of the photosynthetic activity of plants through the solar power and it is an inexhaustible energy source, friendly to the environment, which tends to replace the fossil fuels. The use of biomass is not new, since the human used biomass as the first energy source.

The use of biomass as an energy source has many benefits:

- The energy produced by biomass can be stored in large amounts and as a consequence it can be produced when it is necessary.
- Reduction of carbon dioxide emission
- New stable jobs
- Valuable exploitation of waste and residues, avoiding the pollution of environment
- Biomass is available at any time

Biomass is the only natural energy source with carbon, which can replace the fossil fuels. In contradiction with fossil fuels, biomass needs a small period of time to be replenished and for this reason biomass is renewable energy source. The exploitation of biomass can be done mainly for the production of heat, electricity and motion.

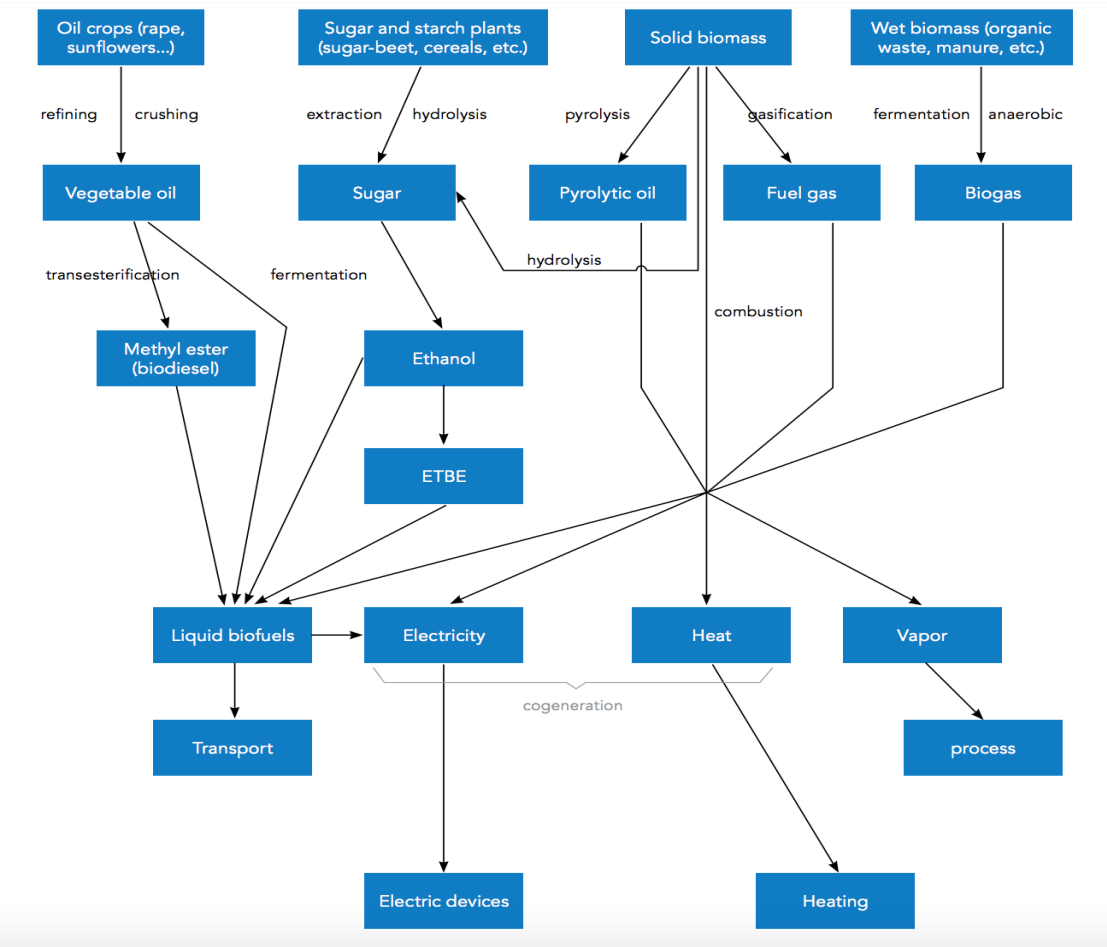
The conversion technologies of biomass to electricity can be divided into three categories: *thermo-chemical conversion technologies* (combustion, combined heat and power (CHP), gasification and pyrolysis), *physico-chemical conversion* and *biochemical conversion* (anaerobic digestion).

The most widespread technologies to generate electricity from biomass are:

- *Direct-firing combustion*: In this technique, biomass fuel is used like burning fossil fuel to produce energy. Specifically, biomass, as a fuel, is burned in a boiler in order to produce high-pressure steam. After this, the produced steam is entered into a turbine, where this steam causes the rotation of the turbine. At the end, this turbine is connected with an electric generator, which is rotated after the rotation of the turbine and produce electricity. [14]
- *Cogeneration or Combined heat and power (CHP)* is the most efficient technique to produce and exploit electricity and thermal energy at the same

[14] Kimble M./ Pasdeloup M.-V., Spencer C., *Sustainable Bioenergy Development in UEMOA Member Countries* (2008) pp. 45-46

time, using the same fuel. In usual thermoelectric plants, only the one-third of the produced energy is converted into electricity and the rest is lost. In contradiction to these plants, in Combined Heat and Power (CHP) plants, the efficiency in production of electricity is significantly bigger, since more than four fifths of the produced energy is converted into usable energy. As a result, this technique has more economic and environmental advantages[15].



Picture 7: Biomass Energy Conversion Overview (Source: Renewable Energy World, 2006)

3.4 Small Hydropower

Small hydropower is based on the conversion of the kinetic energy by the water of rivers, canals and water networks into electricity. This conversion is achieved when the

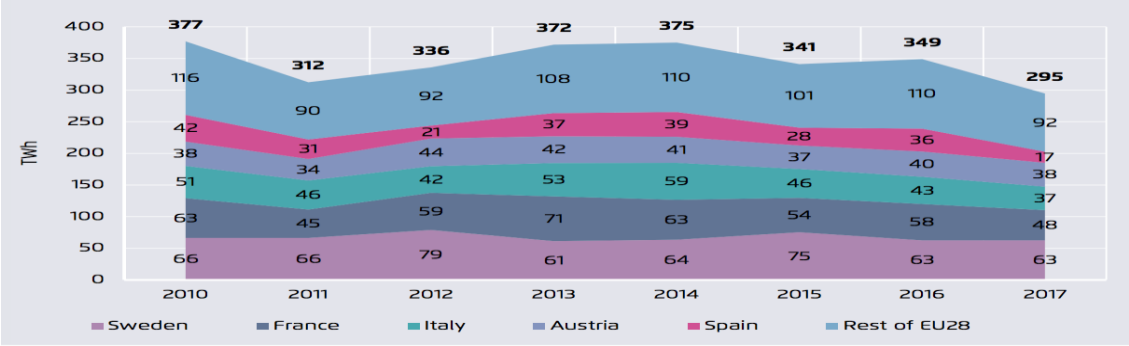
[15] idim p. 46

falling water passes through a turbine, that converts the kinetic energy and pressure of water into mechanical energy, and after this a generator converts this mechanical energy into electricity.

Hydropower is one of the most reliable and cost-effective renewable power generation technologies because it has two main benefits:

- The falling water is stored in an elevated reservoir that enables the production of electricity on demand.
- The production of electricity can take place so fast that grid can be fed at any time, even in unexpected fluctuations in supply or demand.

In 2012, the produced electricity by renewable energy sources reached 44%, from which almost 10% of the total produced electricity came from hydropower. In 2016, the produced electricity that came from hydropower reached 14% of the total produced electricity and at the same time hydropower was the largest renewable energy source in Europe[16]. 2017 was the worst year for hydropower generation, since the produced hydropower fell by 54 Terawatt hours, as shows the below figure[17].



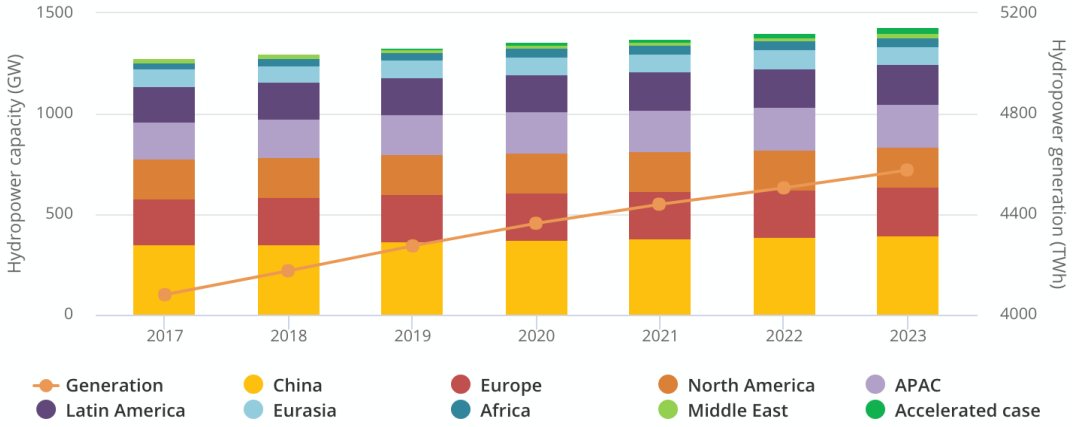
Picture 8: Hydro Electricity Generation in top 5 countires (Source: 'European Power Sector in 2017: State of Affairs and Review of Current Developments', Sandbag, Agora Energiewende)

Finally, for all these reasons, hydropower will remain the most important renewable energy source for the production of electricity by 2023 and will play a very

[16] European Commission, SETIS, *Hydropower* <https://setis.ec.europa.eu/system/files/Technology_Information_Sheet_Hydropower.pdf> accessed 18 December 2018

[17] Sandbag, Agora Energiewende, *European Power Sector in 2017: State of Affairs and Review of Current Developments* (2018) p. 19

important role in improving system flexibility with the parallel development of the existing hydropower plants[18].



Picture 9: Hydropower Generation Capacity by Region, 2017-2023 (Source: International Energy Agency, 'Hydropower')

3.5 Ocean Energy

The generation of electricity by ocean energy is based on the produced energy of tides, waves, currents, salinity and temperature of the sea or ocean. The ocean energy is an important renewable energy source, which can satisfy a very big quantity of electricity supply. An important benefit of ocean energy is that ocean energy can satisfy both the entire electricity demand on islands in remote areas and an important part of the electricity demand on many European countries[19].

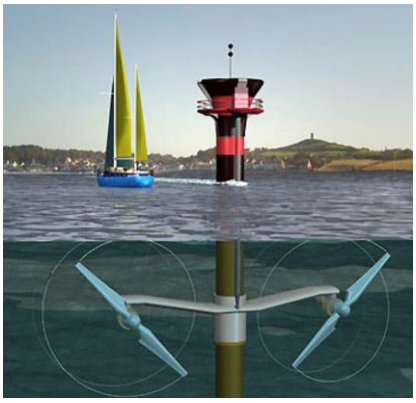
The big difference from the other renewable energy sources is that ocean energy is stored in many forms and is not seized from a single source. The most important forms of ocean energy are:

a) *Tidal current energy*: the energy that is produced by the flows of ocean water, in other words the kinetic energy of ocean water in a tide current. This kinetic energy can be exploited with a variety of new and advanced technologies, such as turbines of horizontal or vertical axis similar to those used on the production

[18] International Energy Agency, *Hydropower* <https://www.iea.org/topics/renewables/hydropower/ > accessed in 18 December 2018

[19] European Renewable Energy Council (EREC), *Renewable Energy in Europe: markets, trends, and technologies* (first published in 2010, second edition, Earthscan 2010) p. 191

of wind energy, which convert the kinetic energy of the flow of the tidal current to electricity[20].



Picture 10: Tidal current energy

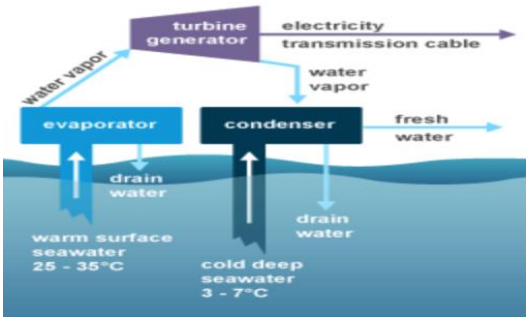
b) *Wave Energy*: the energy that is produced by the kinetic energy of the ocean waves. In substantial, this kinetic energy is produced by the wind that transferred to the surface of the ocean. The wave energy is exploited with various wave energy techniques, which are used to convert the kinetic energy of waves to electricity.

Picture 11: Wave Energy (Source: Wave Star)

c) **Osmotic energy:** the energy that can be produced by the differences in the salt concentration in ocean water at the mouth of rivers where fresh water mixes with salt water. This energy can be exploited with turbines that are installed into ocean water and electrothermical reactions, practices that exploit ocean energy and assist to the production of electricity.

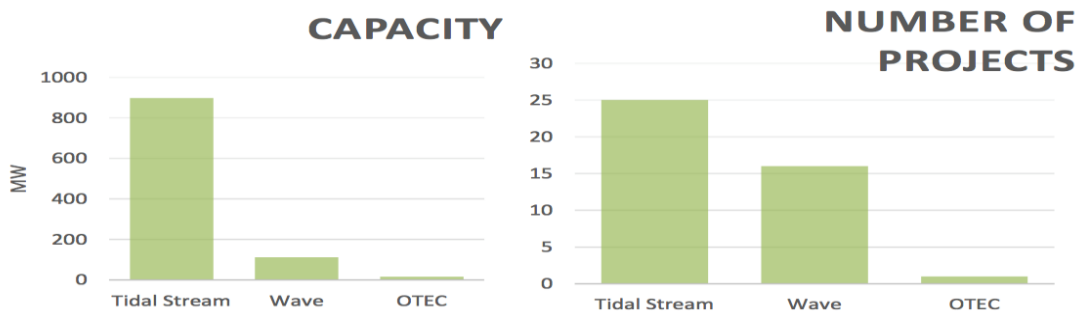
[20] idim pp. 191-192

d) **Ocean Thermal Energy Conversion (OTEC):** this form uses the thermal energy, which is stored in the oceans to generate electricity. This thermal energy is produced owing to the temperature difference between the warm, top layer of the ocean and the cold, deepest layer of the ocean. This energy, which is produced by this temperature difference, is converted to electricity using a turbine.



Picture 12: Ocean Thermal Energy Conversion (OTEC) (Source: U.S. Energy Information Administration (EIA))

According to a market study on ocean energy, which published the European Commission on June 20th, 2018 the projects about tidal stream, which are reported from 2017 to 2032, reached the number of 25 and in respect of the capacity, a total of 897 MW. Furthermore, the projects about wave energy, which are reported from 2015 to 2021, reached the number of 16 and in respect of the capacity, a total of 111 MW and finally in respect of Ocean Thermal Energy Conversion (OTEC), only one 16 MW project was reported occurring in 2020[21].



Picture 13: Capacity and number of Projects reported in the surveys (Europe) (Source: 'Market Study on Ocean Energy', (2018))

[21] *Market Study on Ocean Energy*, General Directorate for Maritime Affairs and Fisheries (European Commission) (2018)

3.6 Geothermal Electricity

Geothermal energy is the produced energy by the heat of the earth. This energy is an inexhaustible energy source, which can produce electricity using the advanced technology of today. In addition, geothermal energy is a low cost energy source and the most important benefit is that it does not pollute the environment with harmful gas emissions.

At first, the exploitation of geothermal energy started for leisure purposes, such as hot springs and geothermal baths. The first step for the production of electricity by geothermal energy was done in 1904, in Larderello, Italy[22]. Since then, the technological applications for the production of electricity by geothermal energy have developed importantly and can be divided in three categories: *dry steam and flash power plants*, *binary cycle power plants also known as Organic Ranking Cycle (ORC)* and *Enhanced Geothermal Systems (EGS)*[23].

According to data of European Commission, in 2015, the power generation by geothermal energy reached 12,7 GW, a number that represents 7,8% of the global installed geothermal energy capacity. In respect of the production of electricity by geothermal energy, the produced electricity reached 5,6 TWh by the end of 2014. The increase of the exploitation of geothermal energy for the production of electricity is enormous in relation with 1990[24]. Finally, according to National Renewable Action Plans (NREAPs) for EU Member States, in 2020, the annual production of geothermal energy in EU has accounted to reach 10,9 TWh from the installed power generation plants[25].

[22] Van Wees J.D. / Boxem T./ Angelino L./ Dumas P., *A prospective study on the geothermal potential in the EU* (2013) p. 5

[23] European Renewable Energy Council (EREC), *Renewable Energy in Europe: markets, trends, and technologies* (first published in 2010, second edition, Earthscan 2010) pp. 210-212

[24] European Commission, Smart Specialisation Platform, *Concentrated Solar Power* <http://s3platform.jrc.ec.europa.eu/geothermal-energy > accessed 20 December 2018

[25] European Commission, EU Science Hub, *Geothermal energy- new report analyses the sector* (2015) <https://ec.europa.eu/jrc/en/news/new-report-analyses-geothermal-energy-sector > accessed 20 December 2018

4. PROGRESS OF EUROPEAN INSTITUTIONAL FRAMEWORK

Until the beginning of 1990, the production of electricity and any other form of energy (such as heat etc.) was based on the use of conventional energy sources. The main conventional energy source at that time was the combustion of fossil fuels such as carbon, which had as a result a dangerous increase of greenhouse gases. This perpetual and increasing pollution of the environment due to the increase of greenhouse gases demonstrated the great necessity of the replacement of conventional energy sources from Renewable Energy Sources, which will contribute to economic development and the protection of environment through the exploitation of inexhaustible energy sources, friendly to the environment and at the same time attract investments and create jobs.

4.1 HISTORICAL REVIEW OF EUROPEAN LEGAL FRAMEWORK

The finding that the replacement of conventional energy sources and the exploitation of Renewable Energy Sources will contribute on the protection of environment, led to the adoption of European and National measures through the establishment of many Directives, Regulations, Communications and Proposals.

The first considerable Community attempt took place in 1996 through the adoption of Green Paper with the title "Energy for the future: Renewable Sources of Energy", with which started an intense discussion on the promotion of Renewable Energy Sources in energy market. In this first Green Paper, the current situation of Renewable Energy Sources is presented, the advantages of their use on the production of energy are analyzed, the obstacles to their complete exploitation are identified and at the end, this Paper set the aims for the future suggesting the adoption of a common policy for the promotion of Renewable Energy Sources. An important target that set in this Paper was the doubling of use of Renewable Energy Sources on the production of energy in percentage of 12% until 2010[26].

[26] Communication from the Commission (COM) *Energy for the future: Renewable Sources of Energy (Green Paper for a Community Strategy)* [1996] 576 final

After one year, in 1997, a second important attempt took place through the adoption of White Paper by the European Commission for a Community policy and Action Plan: "Energy for the future: Renewable Energy Sources", in which European Commission presented the necessity of a common strategy for the promotion of Renewable Energy Sources (RES), in order to be European Union competitive in the energy market using renewable energy sources and in this way the protection of the environment is promoted and becomes the main target. In order to be achieved these targets and adopted this common strategy, an Action Plan was suggested aiming to the access of Renewable Energy Sources in the electricity market, including some internal market measures such as tax benefits and public financing. At the end, through this White Paper, in addition to the doubling of use of Renewable Energy Sources to the production of energy in percentage of 12%, European Commission set the target of 22,1% of the electricity consumption through the use and exploitation of RES until 2010[27].

According to all these attempts above, it was obvious that the exploitation of RES had not taken place to the extreme in European Union and so the promotion of RES was necessary in order to protect environment and at the same time contribute to sustainable development.

The first legislative initiative of European Union for the regulation of the sector of Renewable Energy Sources was the adoption of Directive 2001/77/EC "on the promotion of electricity produced from renewable energy sources in the internal electricity market", which was aiming to promote and increase the use of RES on the production of electricity creating a common Community strategy and policy. The basic and important points of this directive were the below:

- Publication of reports by European Commission, which was accompanied by proposals to European Parliament and Council (Article 3)
- Creation of a single framework for long-term support schemes (Article 4)

[27] Communication from the Commission (COM) *Energy for the future: Renewable Sources of Energy* (White Paper for a Community Strategy and Action Plan) [1997] 599 final

- Guarantee of origin of the energy source from which the electricity was produced according to objective, transparent and non-discriminatory criteria (Article 5)
- The Member-States are imposed to evaluate and improve the legislation regarding the authorization procedures for the entry into service of a power plant operation from Renewable Energy Sources (Article 6)
- At the end, the Directive takes special measures in the Article 7 for the transmission and distribution of electricity produced by RES. In substance, this Article guarantees the transmission and distribution of electricity, promotes the production of electricity by RES and provides that Member States must adopt a common framework, which will ensure transparent procedures of connection in the grid and costing[28].

Four years later, on December 7th, 2005, the European Commission had published a Communication with subject "The support of electricity from renewable energy sources". This Communication was published according to Article 8 of Directive 2001/77/EC, which provided the presentation by European Commission of a report on the implementation of this Directive. In substance, in this Communication are analyzed the obstacles of administrative procedures, grid connection and the implementation of guarantee of origin of the energy source from which the electricity was produced. Finally, improvement of national strategy and policy and cooperation between Member-States are two very important points of this Communication[29].

Another attempt took place on January 10th, 2007 through the publication of another Communication by European Commission to the Council and the European Parliament with subject: "An energy policy for Europe". This Communication was published aiming to the creation of a common energy strategy for a more sustainable, safer and more competitive energy market in European Union, always exploiting Renewable Energy Sources. According to this Communication, the European Commission adopted an Action Plan, which set three targets until 2020:

[28] Directive 2001/77/EC of the European Parliament and of the council on the promotion of electricity produced from renewable energy sources in the internal electricity market [2001] OJ L283/33

[29] Communication from the Commission (COM) *The support of electricity from renewable energy sources* [2005] 627 final

- ✓ 20% reduction of greenhouse gas emissions in Europe by 2020 compared with the 1990 level
- ✓ Increasing the share of Renewable Energy Sources to 20% of gross total EU energy consumption by 2020
- ✓ Reduction of gross total EU energy consumption by 20%

These targets led to the foundation of the current common EU energy strategy and policy, which founded after the international climate agreement of Kyoto Protocol. In substance, this energy plan is consisted of three binding legislative energy targets, known as the "20-20-20" targets:

1) 20% reduction of greenhouse gas emissions in EU
2) Raising the share of Renewable Energy Sources to 20% of gross total EU energy consumption
3) 20% improvement of energy efficiency in EU[30]

After all these attempts, European Union adopted the current Directive for Renewable Energy Sources, the Directive 2009/28/EC, which repealed the Directives 2001/77/EC and 2003/30/EC. The main differences and innovations of the Directive 2009/28/EC[31] are:

- Mandatory national targets for the total use of energy from Renewable Energy Sources
- National Action Plans, which set the targets and the appropriate measures, which must be taken in order to be achieved the targets
- Strategic cooperation between Member-States through joint projects for the production of energy from renewable energy sources
- Simplification of administrative procedures for the approval, certification and licensing of RES power plants

European Union started to prepare for the period after 2020, in order to create a feeling of security to all investors for the future energy policy after 2020:

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[30] European Commission, *2020 climate & energy package* <https://ec.europa.eu/clima/policies/strategies/2020_en>

[31] Directive 2009/28/EC of the European Parliament and of the Council *on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC* [2009] OJ L140/16

- The "Energy Roadmap 2050", which provides the abandonment of carbon from the production of energy and set the target of raising the share of Renewable Energy Sources to 20% of gross total EU energy consumption by 2030[32].
- After the publication of Green Paper (COM (2013) 0169) with the title "A 2030 framework for climate and energy policies" and a Communication with the title "A policy framework for climate and energy in the period 2020 to 2030" (COM (2014) 0015), European Commission suggested not to renew the mandatory national targets for renewable energy sources after 2020[33].
- In November 2016, European Commission published a proposal for a recast "DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on the promotion of the use of energy from renewable sources", in order to be achieved the target of increasing the share of Renewable Energy Sources to 27% of gross total EU energy consumption by 2030[34].

4.2 LIBERALIZATION OF ELECTRICITY MARKET

The Union legislation in force on renewable energy sources and electricity, as analyzed above, is the Directive 2009/28/EC, which repealed the Directives 2001/77/EC and 2003/30/EC. However, the adoption of such a general Directive about R.E.S. and electricity demonstrated the necessity for the adoption of a more specific Directive concerning the organization and management of the electricity market promoting the production of electricity from R.E.S.

The first attempt took place a few years after the adoption of the Directive 2001/77/EC, specifically on June 26th, 2003, when was adopted the Directive 2003/54/EC. This Directive repealed the Directive 96/92/EC, when started an attempt

[32] Communication from the Commission to the European Parliament, the Council, the European Economic AND Social Committee and the Committee of the Regions (COM) *Energy Roadmap 2050* [2011] 885 final

[33] Gouarderes F./ McWatt V./ Fleuret L., *Renewable Energy* (2018) Fact Sheets on the European Union <http://www.europarl.europa.eu/factsheets/en/sheet/70/%CE%B1%CE%BD%CE%B1%CE%BD%CE%B5%CF%89%CF%83%CE%B9%CE%BC%CE%B5%CF%82-%CF%80%CE%B7%CE%B3%CE%B5%CF%82-%CE%B5%CE%BD%CE%B5%CF%81%CE%B3%CE%B5%CE%B9%CE%B1%CF%82 >

[34] Communication from the Commission (COM) *Proposal for a Directive of the European Parliament and of the Council on the promotion of the use of energy from renewable sources (recast)* [2016] 767 final

for the liberalization of the electricity market in European Union. Liberalization of the market means the transition from the monopoly regime to an open and competitive market.

This opening of the electricity market opened at the same time the access of the privates to the supply and production of electricity. It was obvious that the liberalization of the electricity market and the abolition of the monopolies led to the entry of the privates in the electricity market through investments that brought a new dynamic in the market and contributed to the penetration of renewable energy sources in the market. Today, the vast majority of the installed RES power plants were constructed, installed, operated and owned by privates.

In substance, the management of electricity market was divided into two periods: the period before and the period after the liberalization of electricity market. Before the liberalization market, it was applied the monopoly regime, which means that the production, supply, transmission and distribution of electricity carried out only by a single entity. This regime had as a result that the cost of electricity and the cost of operation of power plants transferred to the consumer, who used to pay these costs. This changed when European Union (EU) understood that it was necessary to be developed a single internal market throughout EU and so the liberalization of the market was the only way.

The liberalization of the electricity market, which started with the adoption of the Directive 96/92/EC, achieved with the adoption of the Directive 2003/54/EC. This Directive repealed the Directive 96/92/EC and established common rules for the production, supply, transmission and distribution of electricity and rules concerning the organization and management of electricity market, the access to the market, the criteria and administrative procedures for the submission of offers and participation to tenders, and licensing procedures for entry into service of a power plant operation from Renewable Energy Sources. This Directive, like others, had problems and the most important problems were that the access to the electricity network was not

equal and the regulatory framework did not exist in many Member-States. Thus, the Directive 2009/72/EC was adopted in order to correct these problems[35].

The Directive 2009/72 set some general rules for the organization of electricity sector, which form integral and crucial part of the European regulatory framework for electricity:

- ⇒ *Public service obligations and consumer protection (Article 3):* the supply of electricity to consumers at a reasonable, comparable and transparent price and in a specified quality. In this provision are included, also, the protection of vulnerable customers and the foundation of last resort entity. These are provisions, which adopted as a consequence of the liberalization of electricity market.
- ⇒ *The monitoring of security of supply (Article 4):* monitoring the levels of supply and demand, the future demand, the quality of current networks and the approach of emergency cases of lack of electricity.
- ⇒ *Technical rules (Article 5):* setting technical rules regarding both the generation and distribution networks and the consumers who are able to connect directly with the grid.
- ⇒ *Promotion of regional cooperation (Article 6):* cooperation between regulatory authorities of each Member-State aiming to the unification of their electricity markets and to the creation of an integral liberalized electricity market.

In order to promote the liberalization of electricity market through a development of a competitive market, access to the grid is necessary to be provided in a reasonable price and in an equal and transparency way, as mentioned above. The main and most important result of the liberalization of the market was the entry of privates in the energy market that contributed on the penetration and promotion of R.E.S., because the R.E.S. projects are capital-intensive investments that only privates and not public companies can make.

[35] Panagos T., *Handbook of Energy Law* (2015), pp. 11-12

4.3 AUTHORISATION PROCEDURE

Firstly with the Directive 2003/54/EC and subsequently with the Directive 2009/72/EC (Electricity Directive), the liberalization of electricity market was achieved, as analyzed above. The liberalization of electricity market means the transfer from a monopoly regime to an open and competitive market. Private entities had the ability to get access to production and supply activities and so a new competitive market was created. In that way, the consumers had the possibility to select the producer and supplier, who covered both their economical and qualitative criteria. In substance, the most important element of this liberalization is that the consumer has now the ability of choice.

However, the main priority of European Union remains the production of electricity by using Renewable Energy Sources, according to the Directive 2009/28/EC (RES Directive). As analyzed above, this Directive set out binding targets for the exploitation of RES to the production of electricity such as the following target: the share of Renewable Energy Sources shall be at least 20% of gross total EU energy consumption in 2020.

From the combination of the Electricity Directive and the RES Directive, the production of electricity is based on the exploitation of renewable energy sources. This is perceived by the fact that priority in the sale of the produced energy by the electricity producers to the Market operator (mandatory pool) has the produced energy by renewable energy sources, even if this energy from RES costs more than the produced energy by conventional energy sources.

In substance, the entrance of privates in electricity market demonstrated the necessity of setting up some specific criteria that must have these privates to produce and supply electricity and a specific procedure for granting licenses to privates to construct power plants. According to article 13 of Directive 2009/28/EC (RES Directive), the Member-States must ensure that some important general principles shall be determined and followed by the interested parties in the licensing procedure for RES power plants:

⇒ *Principle of transparency*: this principle contributes to the fight against corruption of competent authorities for granting licenses, guarantees the

control and contributes to the effective functioning of these authorities and protection of the rights all of the interested parties in the licensing procedure.

⇒ *Principle of equal treatment*: equal treatment among the applicants for granting a license to generate electricity from RES, establish and operate a RES power plant, namely equal rules and criteria applying in the licensing procedure.

⇒ *Principle of proportionality:* the rules applied to the licensing procedure must not exceed what is necessary to achieve the objectives of this procedure for licensing of RES power plants.

⇒ *Principle of good administration:* this principle is very important for all administration procedures in EU and is provided by Article 41 of CFR. According to this principle, every person has the right to be treated fairly, equally, within a reasonable time and leniency.

This Directive does not determine the administration and licensing procedure, but on the contrary, provides that the Member-States must determine this procedure respecting the above principles. According to article 13, paragraph 2 of RES Directive, the Member-States shall determine the technical rules that must be applied by renewable energy sources power plants in order to benefit from support schemes. These support schemes create incentives in order to be achieved a higher exploitation of RES in the electricity sector[36].

The same "tactic" was followed by the Directive 2009/72/EC (Electricity Directive), which did not determine the administrative and licensing procedure for the installation of power plants and in substance repeated the RES Directive. According to article 7 of Electricity Directive, the Member-States must determine the criteria of granting licenses to establish power plants for producing electricity and these criteria must be "objective, transparent and non-discriminatory", as is mentioned also in article 13 of RES Directive. The innovations that introduces the Electricity Directive are the below:

- The provision of *National Regulatory Authorities*, which are responsible for determining and amending the guidelines for the authorisation procedure.

[36] Panagos T., *Handbook of Energy Law* (2015), pp. 16-17

- *Publication* of criteria and authorisation procedures, *justified refusal* for granting an authorisation and availability of *appeal procedures* in these cases of refusals.
- Application of a tendering procedure in a case that the produced capacity of electricity through authorisation procedure of article 7 is insufficient to ensure security of supply. This tendering procedure must ensure transparency and impartiality and for this reason this article obligates the Member-States to apply objective and non-discriminatory criteria for the procedure of call for tender. Finally, it is provided the designation of a public authority or private body independent from the activities of production, supply, transmission and distribution to control and monitor this tendering procedure.

5. PROGRESS OF NATIONAL INSTITUTIONAL FRAMEWORK

In parallel with the progress of European institutional framework concerning the promotion of Renewable Energy Sources (R.E.S.), an attempt for a more systematic exploitation of RES to the generation of electricity at a national level was perceived. The first attempt in Greece took place in 1985 with the Law 1559/1985 and the current legislation concerning the promotion of R.E.S. to the production of electricity is the Law 3468/2006 under the harmonization of the Directive 2009/28/EC and the changes that took place according to the Laws 3851/2010, 4062/2012 and 4414/2016.

5.1 HISTORICAL REVIEW OF NATIONAL LEGAL FRAMEWORK

At national level, the use of R.E.S. on the generation of electricity was insignificant, until the first attempts take place at the beginning of 1990s in European Union. The first attempt took place in Greece a little bit sooner in 1985 with the Law 1559/1985[37]

[37] Law No 1559/1985 *on the regulation of issues concerning the alternative forms of energy and specific issues concerning the generation of electricity by conventional fuels and other provisions* (1985) Greek Government Gazette 135/A/1985

on the "regulation of issues concerning the alternative forms of energy and specific issues concerning the generation of electricity by conventional fuels and other provisions". This legislation had provided for the first time the generation of electricity by privates, but it had not provided any incentives to them to make investments on the construction of power plants for generation of electricity by R.E.S. On the other hand, this legislation had discouraged these investments from privates because the "P.P.C. S.A." (Public Power Corporation S.A.) still had the monopoly of the generation, supply, transmission and distribution of electricity and so the electricity that the privates would have produced, will be sold to the "P.P.C. S.A." in a very low price. In conclusion, this legislation failed utterly.

The first substantial attempt at national level took place in 1994 with Law 2244/1994[38] on the "regulation of issues concerning the generation of electricity by renewable energy sources and conventional fuels and other provisions". This National act had determined for the first time the institutional and licensing framework about the generation of electricity from R.E.S. and has provided the ability of generation of electricity by privates. The big difference from the Law 1559/1985 was that the Law 2244/1994 determined adequate and uniform prices concerning the sale of the produced energy by privates to the "P.P.C. S.A.", as well as ten-year contracts of sale, providing incentives to privates for attracting investments for construction of power plants by RES and by this way the economy will be developed.

Five years later in 1999, Greece adopted the Law 2773/1999[39] on the "liberalization of electricity market - regulation of issues concerning energy policy and other provisions". This legislation established for the first time the obligation of taking a license for generation of electricity also from Renewable Energy Sources (R.E.S.). In addition, this Law provided that the generation, supply, transmission and distribution of electricity are services of general interest and the power plants from R.E.S. are works of general interest. According to these two above important points, the

[38] Law No 2244/1994 *on the regulation of issues concerning the generation of electricity by renewable energy sources and conventional fuels and other provisions* (1994) Greek Government Gazette 168/A/1994

[39] Law No 2773/1999 *on the Liberalization of electricity market- Regulation of issues concerning energy policy and other provisions* (1999) Greek Government Gazette 286/A/1999

jurisprudence of Greek Supreme Court (Council of State), which is competent for public disputes, concerning the entry into service of power plants from R.E.S., started to be perceived. Finally, it was provided very attractive prices of sale of R.E.S. and priority of RES to their access to the grid.

In 2001, an important attempt for the simplification of licensing procedures for construction and entry into service of a power plant operation from renewable energy sources, took place. This simplification applied with the Law 2941/2001[40] on the "Simplification of procedures for setting up companies, licensing procedures for Renewable Energy Sources, regulation of issues concerning the S.A. "HELLENIC SHIPYARDS" and other provisions".

After this Law, Greece adopted the most important legislation concerning the promotion of renewable energy sources for the production of electricity, the Law 3468/2006[41] on the "production of electricity from Renewable Energy Sources and Cogeneration of high efficiency heat and power", which applies until now after the changes that made the subsequent Laws 3851/2010, 4062/2012 and 4414/2016. The Law 3468/2006 harmonized the Directive 2001/77/EC, which was aiming to promote and increase the use of R.E.S. to the production of electricity creating a common Community strategy and policy. This Law was adopted in order to solve the big problems of time-consuming administrative and licensing procedures, with the result that privates were not able to invest on the construction of power plants from R.E.S. The main points of this Law are the below:

- ⇒ The priority access of the produced electricity from renewable energy sources to the "mandatory pool", where the producers sell their produced electricity to the market operator, so the sale of produced electricity was guaranteed
- ⇒ A system of monthly pricing
- ⇒ The system of the guaranteed origin of the electricity from renewable energy sources

[40] Law No 2941/2001 *on the Simplification of procedures for setting up companies, licensing procedures for Renewable Energy Sources, regulation of issues concerning the S.A. "HELLENIC SHIPYARDS" and other provisions* (2001) Greek Government Gazette 201/A/2001

[41] Law No 3468/2006 *on the production of electricity from Renewable Energy Sources and Cogeneration of high efficiency heat and power* (2006) Greek Government Gazette 129/A/2006

⇒ As regards to the licensing procedure, the previous procedures for the issuance of licenses for the production of electricity and the environmental licensing were remained in force with the only difference of their simplification and acceleration

⇒ According to article 27, paragraph 9, the Law sets as National target of the share of Renewable Energy Sources to the gross total national energy consumption the percentage of 20,1% by 2010 and the percentage of 29% by 2020. These targets are in compliance with the targets that set the Directive 2001/77/EC in article 3, paragraph 4.

Subsequently, the Law 3734/2009[42] on the "promotion of cogeneration of two or more useful forms of energy, regulation of issues concerning the Hydroelectric Project of Mesohora and other provisions", achieved an improvement of the licensing procedure for the power plants from RES concerning the Opinions of the Regulatory Authority of Energy (RAE) and the issuance of licenses for production of electricity and installation and operation of power plants with Ministerial Order. In addition, regulations concerning the pricing and the award of long-term contracts in a fixed price and the simplification of the access to the System by the competent administrator.

One year later, it was adopted the next very important legislation for the promotion of RES on electricity, the Law 3851/2010[43] on the "speeding up the development of Renewable Energy Sources to address climate change and other provisions in matters of competence of the Ministry of Environment, Energy and Climate Change". This Law harmonized the Directive 2009/28/EC and amended the Law 3468/2006 on many points. The main points of this Law are the below:

- The article 1 amended the article 1 of the Law 3468/2006 and set the National binding targets by 2020 complying with the Directive 2009/28/EC.

[42] Law No 3734/2009 *on the promotion of cogeneration of two or more useful forms of energy, regulation of issues concerning the Hydroelectric Project of Mesohora and other provisions* (2009) Greek Government Gazette 8/A/2009

[43] Law No 3851/2010 *on the speeding up the development of Renewable Energy Sources to address climate change and other provisions in matters of competence of the Ministry of Environment, Energy and Climate Change* (2010) Greek Government Gazette 85/A/2010

- Simplification of the administrative procedures setting sooner deadlines to the Administration and creation of the system of «one stop shop» to provide information to the possible investors.
- The Greek Regulatory Authority for Energy (R.A.E.) issues the license for the production of electricity or other form of energy from renewable energy sources from now on.
- The disconnection of the licensing procedure for the production of energy by R.E.S. from the procedure for environmental licensing. From now on, after the issuance of the license for the production, it was established a new procedure of *Preliminary Environmental Assessment and Evaluation (EEPA)* and *Approval of Environmental Terms (AET).*
- Remaining into force the priority access of the produced electricity from renewable energy sources to the "mandatory pool", where the producers sell their produced electricity to the market operator.
- The most important element that provided this Law is that the restriction of the maximum of the installed capacity of Renewable Energy Sources that provided by Law 2773/1999 was lifted, leading to the installation of big R.E.S. power plants.

After the big steps that took place in Europe aiming to the liberalization of the electricity market, it came the turn of Greece. This big step was done in Greece with the adoption of Law 4001/2011[44] on the "operation of Energy Markets of Electricity and Natural Gas, for Research, Production and Transmission Networks of Hydrocarbons and other regulations". This Law harmonized the Directive 2009/72/EC (Electricity Directive) and 2009/73/EC (Natural Gas Directive) and was adopted in the context of the commitments of Memorandum and the implementation of the program for privatizations. The big and important innovation of this Law was that the sectors of transmission and distribution of electricity were detached from "P.P.C. S.A." (Public Power Corporation S.A.) and for this reason two big subsidiaries were created to

[44] Law No 4001/2011 *on the operation of Energy Markets of Electricity and Natural Gas, for Research, Production and Transmission Networks of Hydrocarbons and other regulations* (2011) Greek Government Gazette 179/A/2011

undertake these two sectors: *1) I.P.T.O. S.A. (Independent Power Transmission Operator S.A.),* responsible for transmission sector, *2) H.E.D.N.O. S.A. (Hellenic Electricity Distribution Network Operator S.A.)*, responsible for the distribution sector.

After these important Laws that adopted, a number of Laws and Ministerial Orders were adopted until now, such as the Laws 4062/2012, 4414/2016 and 4585/2018, which established the current institutional framework applying in the current liberalized electricity market for entry into service of power plants from renewable energy sources.

5.2 NATIONAL RENEWABLE ENERGY ACTION PLAN

According to Directive 2009/28/EC that obliged the Member-States to adopt national Action Plans for the protection of environment and the promotion of renewable energy sources, Greece adopted a National Renewable Energy Action Plan, in order to achieve R.E.S. penetration to final energy consumption in a percentage of 20% by 2020. This National Action Plan set some binding targets that were included in the Law 3851/2010. A special and important role to the creation of National Action Plan concerning the intended installed capacity from 2014 by 2020 played the issuance of *Ministerial Decree No 19598 of 1st October 2010*[45]. The main elements of this Action Plan was the below:

- Reduction of greenhouse gas emissions in a percentage of 4% in all sectors except from the commercial sector
- Increasing R.E.S. contribution to 18% of gross total energy consumption
- Increasing the share of Renewable Energy Sources to 20% of gross total energy consumption, which analyzed in 40% RES contribution in generation of electricity, 20% in needs of heating and cooling and 10% in transportations. As regards the R.E.S. contribution in generation of electricity, the intended installed capacity per R.E.S. technology and per category of generator according to the above *Ministerial Decree* is the below:

[45] Ministerial Decree No A.Y./F1/ik. 19598 (Greek Government Gazette B'1630/11.10.2010)

Categories	***2014 (MW)***	***2020 (MW)***
Hydroelectric	**3700**	**4650**
Small (0-15MW)	300	350
Large (>15MW)	3400	4300
Photovoltaic	**1500**	**2200**
Installations by professional farmers of Article 15, paragraph 6 (b) of Law 3851/2010	500	750
Other installations	1000	1450
Solar thermal	**120**	**250**
Wind (including marine ones)	**4000**	**7500**
Biomass	**200**	**350**

Table 1*: Limits on installed capacity (MW) per R.E.S. technology and per category of generator* (Source: http://www.ypeka.gr/)[46]

This National Action Plan acted as a tool for monitoring the national energy targets and for this reason it can be amended and examined every two years, depending on the policy and strategy that applies, the response of the energy market and the technological development of renewable energy sources, in order to be conformed in the needs of the market. In this way, the targets that set up the Directive 2009/28/EC and harmonized in the Greek legislation with this National Action Plan will be achieved by 2020[47].

5.3 LICENSING PROCEDURE FOR INSTALLATION OF POWER PLANTS FROM RENEWABLE ENERGY SOURCES

The licensing procedure for installation of power plants from Renewable Energy Sources in Greece is regulated by Law 3468/2006, after the amendments of the Laws 3851/2010, 4001/2011, 4062/2012, 4414/2016 and 4585/2018. This Law harmonized

[46] idim

[47] Ministry of Environment and Energy, *National Action Plan for Renewable Energy Sources* <http://www.ypeka.gr/LinkClick.aspx?fileticket=vBWJVY3FdTk%3d&tabid=37 > accessed 2 January 2019

the European Directive 2009/28/EC, too. The objective of all these amendments by these Laws was the simplification and acceleration of the licensing procedure with a view to promote the investments in the sector of electricity from R.E.S.

5.3.1 GENERATION LICENSE

The generation of electricity from renewable energy sources (R.E.S.), like all energy activities, is subject to a licensing procedure, which is provided in detail by Law 3468/2006 in article 3 and further. The interested part submits a request together with the entire folder to the Regulatory Authority for Energy (R.A.E.), *which now decides and does not consult anymore* for granting or not generation license. The decision of R.A.E. is based on a list of criteria:

- ⇒ Protection of public health, security and environment
- ⇒ Safety of the electricity facilities and equipment
- ⇒ Energy efficiency of the power plant
- ⇒ Ability of the applicant to carry out the work from R.E.S. based on its technical and economical efficiency and in compliance with the Special Framework for Spatial Planning and Sustainable Development for R.E.S. and the National Action Plan for R.E.S.
- ⇒ Compliance with the measures concerning public service obligations and consumer protection[48]

After considering the above criteria, R.A.E. decides for granting or not the generation license in a period of two (2) months from the submission of the application. The decision is published on the R.A.E.'s website, on a daily newspaper of Panhellenic circulation and is notified to the Minister of Environment, Energy and Climate Change, who examines the legality of the generation license in a period of twenty (20) days from the receipt of the notification request. Against this decision, there is the opportunity of bringing an action from whoever has legal interest in a period of fifteen (15) days from the publication on the R.A.E.'s website.[49]

[48] Law No 3468/2006 *on the production of electricity from Renewable Energy Sources and Cogeneration of high efficiency heat and power* (2006) Greek Government Gazette 129/A/2006, art. 3, para. 1

[49] idim art. 3, para. 2

The generation license must include some specific elements that are mentioned below:

a) The particulars of the holder of the license, producer, either it is natural person or a legal entity
b) Place of establishment of the power plant
c) The installed power and the maximum power generation
d) The used technology and the form of R.E.S., whether the license is granted for a power plant from R.E.S.
e) Validity period of the license
f) The natural persons or legal entities, which finance the project[50]

The validity period of the generation license can be up to twenty-five (25) years and can be renewed up to the same period of time.[51] The holder of license can transfer it to other natural persons or legal entities, according to the decision of R.A.E.[52] In respect of the licensing procedure for generation of electricity to Non-Interconnected Islands or to congested electricity networks, the applications of electricity Self-producers from R.E.S. are being processed as a priority.[53]

Article 4, paragraph 1 of Law 3468/2006 provides a list of exclusions from the obligation of taking the generation license for some categories of power plants from R.E.S. with low installed capacity. All these exclusions from the obligation of licensing for generation of electricity from R.E.S., the transfers and the amendments or revocations of licenses are registered to a Special Electricity Production Registry, which is kept from R.A.E. Any amendment of the elements that are registered to this Special Registry is notified from the holder of the license to R.A.E. and Minister of Development. When the alterations of the elements that are registered to this Registry cannot be considered as amendments of the generation licenses, R.A.E. issues a relative certificate.[54]

[50] idim art. 3, para. 3
[51] idim art. 3, para. 4
[52] idim art. 3, para. 6
[53] idim art. 3, para. 7
[54] idim art. 5, para. 2

5.3.2 ENVIRONMENTAL LICENSE

After the issuance of the generation license, the holder of this license submits a request simultaneously to issue:

a) *Connection offer* by the competent Administrator

b) Decision approving the Environmental Terms

c) *Intervention License to forests or woodlands*, when required.[55]

The above three activities can take place at the same time, in order to be shortened the licensing procedure.

The decision approving the Environmental Terms is issued according to article 4 of Law 1650/1986 and also according to the same article, the whole folder and the Environment Impact Assessments (E.I.A.) are submitted to the competent for the issuance of environmental license authority. If the competent authority does not ask in writing from the applicant additional elements in a period of twenty (20) days, the submitted folder is considered completed. Furthermore, the competent authority for the environmental license is obliged to decide for granting or not the environmental license in a period of four (4) months from the moment the folder and the Environment Impact Assessments (E.I.A.) are considered complete.[56]

At this time, it is necessary to be mentioned that the Law 1650/1986 has been amended by the Law 4014/2011. However, these amendments had related to environmental licensing procedure for works and activities, while the broader institutional framework concerning the protection of environment continues to be regulated by the Law 1650/1986. In addition, one very important point of view that has been consolidated by the case law of the Council of State[57] concerning the Decision approving the Environmental Terms for R.E.S. projects is the environmental impact of the electric and magnetic fields of electricity transmission.[58]

Furthermore, the validity period of the Decision approving the Environmental Terms is ten (10) years and can be renewed for one or more times up to the same

[55] idim art. 8, para. 3

[56] idim art. 8, para. 6

[57] Case 3919/2010 The Council of State Plenaries [2010]

[58] Tzouli M., *The Greek institutional framework for entry into service of power plants from RES within the European framework* (2017) i. 4/2017 Environment and Law 681, 685

period of time. The request for renewal has to be submitted six months prior to the expiry date of this Decision. Until the issuance of the decision for renewal, the previous Environmental Terms apply.[59]

5.3.3 INSTALLATION AND OPERATION LICENSE

The Decision approving the Environmental Terms has been issued and the Connection Offer by the competent Administrator has become binding. According to article 8, paragraph 5 of the Law 3468/2006, after the above procedures, the beneficiary of electricity generation from R.E.S. submits a request for granting the license for establishment of the power plant from R.E.S. The power plants from R.E.S. can be installed and operate to the below areas:

A. In a field or in an area, which the applicant can use lawfully,
B. in forests or woodlands, where works can be undertaken lawfully, according to articles 45 and 58 of Law 998/1979 "On the protection of forests and woodlands of the Country",
C. in the foreshore area, beach, sea or in the seabed, which the applicant can use lawfully, according to article 14 of Law 2971/2001 about "Foreshore area, beach and other provisions".

The installation license is granted to the beneficiary of electricity generation from R.E.S. following the decision of the Secretary-General of the Region where the power plant is established, while, as regards the power plants from R.E.S. for which the environmental license is granted by the Minister of Environment, Energy and Climate change, the installation license is granted also by the Minister. The time limit for the issuance of the installation license is fifteen (15) working days from the completion of the examination of submitted supporting documentation, but, in any case, this examination must have been concluded in a period of thirty (30) working days from the submission of the related request.[60] The installation license is granted only once;

[59] Law No 3468/2006 *on the production of electricity from Renewable Energy Sources and Cogeneration of high efficiency heat and power* (2006) Greek Government Gazette 129/A/2006, art. 8, para. 7
[60] idim art. 8, para. 1 and 2

its validity period is two (2) years and can be renewed up to two times after submission of a relevant request by the holder of the license.[61]

After granting the installation license, the only activity that remained from the whole licensing procedure for entry into service of the power plants from R.E.S. is the acquisition of the license for operation of the power plant. The beneficiary of the installation license submits a request to the same authority that was competent for the issuance of installation license for granting the license for operation. The operation license is issued obligatory in a period of twenty (20) days from the completion of all necessary control procedures, according to what the decision of Minister of Environment, Energy and Climate change provides.[62]

The validity period of the operation license is at least twenty (20) years and can be renewed up to the same period of time.[63] According to article 8, paragraph 13, the power plants from R.E.S., which are exempted from the obligation of acquisition of generation license (Article 4 of Law 3468/2006), are exempted also from the obligation of acquisition of installation and operation license, but they are obliged to obtain the environmental license according to article 4 of Law 1650/1986.

Finally, the specific procedures for granting installation and operation licenses, the supporting documentation and the procedure for submitting this documentation, are determined with the issuance of the Decision of the Minister of Environment, Energy and Climate change.[64]

5.3.4 POWER PURCHASE AGREEMENTS (P.P.A.) FROM RENEWABLE ENERGY SOURCES

After all this licensing procedure for the generation of electricity, installation and operation of power plants from R.E.S., the Administrators are obliged to conclude purchase agreements with the holder of the generation license, in order to join this power the System or the Grid. The validity period of this purchase agreement is twenty (20) years. In addition, the type, the content and the procedure of conclusion of these

[61] idim art. 8, para. 10
[62] idim art. 8, para. 11
[63] idim art. 8, para. 12
[64] idim art. 8, para. 16

purchase agreements are determined with a decision of Minister of Development, after the suggestion of the competent Administrator and the Opinion of R.A.E.[65]

At this point, it is absolutely necessary to distinguish two differentiated types of Power Purchase Agreements:

a. When the power plants are connected to the interconnected network either directly or through the Distribution network, *the Power Purchase Agreements are concluded with the Operator of Electricity Market (O.E.M.)*
b. When the power plants are connected to the Network of Non-interconnected Islands, *the Purchase Agreements are concluded with the Hellenic Electricity Distribution Network Operator (HEDNO)*.[66]

This above regime of the access of the licensed power plants to the interconnected network and grid was amended with the Law 4414/2016[67], which started to apply on January 1th, 2016. According to articles 3, 4 and 6 of Law 4414/2016, the Operator of Electricity Market (O.E.M.) is obliged now to conclude *Sliding Premium Operating Aid Contract* with the owner of the power plant from R.E.S. The validity period of the Sliding Premium Operating Aid Contract is twenty (20) years.[68]

This new Law 4414/2016 provided a transitional situation in article 3, paragraph 11, according to which the power plants from R.E.S. that had concluded Power Purchase Agreements until 31.12.2015 according to article 12 of Law 3468/2006, does not fall within the new regime of Law 4414/2016.[69]

[65] idim art. 12

[66] Tzouli M., *The Greek institutional framework for entry into service of power plants from RES within the European framework* (2017) i. 4/2017 Environment and Law 681, 688

[67] Law No 4414/2016 on the *New support scheme for power plants from Renewable Energy Sources and Cogeneration of High Performance Electricity and Heat - Provisions for the legal and functional separation of supply and distribution sectors in the gas market and other provisions* (2016) Greek Government Gazette 149/A/2016

[68] Tzouli M., *The Greek institutional framework for entry into service of power plants from RES within the European framework* (2017) i. 4/2017 Environment and Law 681, 688

[69] idim p. 689

5.4 COUNCIL OF STATE'S CASE LAW - CONTRIBUTION

As mentioned above, the biggest problems and obstacles concerning the promotion of generation of electricity by renewable energy sources are identified mainly in the licensing procedure for generation, installation and operation of the power plants. The case law of Council of State on the protection of environment was instrumental and determined largely the current institutional framework for entry into service of power plants from R.E.S. starting from the generation license until the Decision approving the Environmental Terms and installation and operation license of power plants.

In particular, according to the case law of the Council of State, the renewable energy sources are energy sources friendly to the environment contributing to sustainable development. The protection of environment is achieved with the generation of energy by renewable energy sources, which leads to the reduction of greenhouse emissions and with this way *the public interest is served*.

Lack of legislative provision concerning the spatial planning for the installation of power plants from R.E.S., the complicated and long licensing procedures and lack of information regarding the whole licensing procedure led many cases concerning licensing actions for power plants from R.E.S. to be judged before the Council of State.

The power plants from renewable energy sources are undoubtedly friendly to the environment and serve the public interest, but in the other hand, these power plants could have adverse effects in particular in sensitive for the environment areas such as woodlands, forests, Special Protection Areas (SPAs), areas included in Natura 2000 and areas with protected species. For this reason, according to the case law of the Council of State, it is necessary to be preceded the Environment Impact Assessment (E.I.A.) in order to be made an assessment of the expected effects of the power plant to the environment.

In addition, there is extensive case law relating the spatial planning of these power plants taking into consideration the approval of the Special Framework for Spatial Planning and Sustainable Development for R.E.S. in 2008, according to which rules and criteria relating the spatial planning of the power plants from RES set up in order to be created a clear institutional framework without uncertainties that will determine the

most suitable areas for R.E.S. installations based on the Spatial Planning. At this point, it is important to be mentioned the case law relating the installation of R.E.S. power plants in protected areas, nature reserves and in areas included on the national list of Natura 2000.

Furthermore, one very important part of the case law relating the installation of R.E.S. power plants and the protection of environment is the installation of these power plants in woodlands and reforestation areas, case law according to which the conditions for the grant of the installation and operation license in such an area are very strict and must be provided specific reasons considering specific criteria.

Finally, it is necessary to be mentioned and analyzed some very important cases of the Council of State regarding all the issues that mentioned above and which set out a very clear institutional framework concerning the licensing of RES power plants in combination with the protection of environment:

- At first, the *Case 171/2012 of the Council of State, Parole Board, Fifth Section* concerning the protection of environment, was of particular interest. According to this Case, the Renewable Energy Sources are energy sources that are friendly to the environment contributing to sustainable development and the generation of electricity by R.E.S. leads to the reduction of greenhouse emissions and with this way the public interest is served. In addition, it is stressed that the installation of wind power plants is not possible in areas included in Natura 2000.

- In the other hand, according to the *Case 47/2018 of the Council of State, Fifth Section,* the installation of wind power plants in areas included in Natura 2000 and in Special Protection Areas (SPAs) is not excluded by the National or European legislation, but it is possible to be imposed additional restrictions on the location of these power plants because of the characteristics of the area. In conclusion, the public interest that is served through the generation, installation and operation of the power plants from R.E.S. must be achieved with as little deterioration of the forests, woodlands and reforestation areas as possible. Finally, according to *the Case 1657/2005 of the Council of State, Fifth*

Section, the competence of the Approval of Environmental Terms for installation of R.E.S. power plant in areas included on the national list of Natura 2000 remained to the competent Ministers and was not transferred to the Secretary-General of the Region. The Environment Impact Assessment (E.I.A.) shall be prepared by a competent person who has a degree relevant to the subject matter.

- Furthermore, the *Case 2499/2012 of the Council of State, Plenary Session,* and the *Case 513/2016 of the Council of State, Fifth Section,* regarding the installation of RES power plants in forests, woodlands and reforestation areas, are cases with special interest. According to the *Case 2499/2012,* the installation and operation of wind power plant in reforestation area is permitted, if the approval decision is specifically justified considering both the particular importance of the R.E.S. project and the need of installation of this R.E.S. project to the reforestation area. Finally, according to the *Case 513/2016,* the installation of wind power plant in forest is permitted only if there is not suitable woodland. In addition, the Environment Impact Assessment (E.I.A.) examines the morphological, geological characteristics and the impact of the RES project to landscape aesthetics and birdlife, so the application of annulment of the Decision approving the Environmental Terms was rejected.

6. CONCLUSIONS

It is known worldwide that none of the forms of energy, as renewable and friendly to the environment as it is, has no harmful impact to the environment. However, it is proven that the use of conventional energy sources for electricity generation has much more harmful impacts to the environment than renewable energy sources.

European Union realized too fast that the use of renewable energy sources in electricity generation was necessary. For this reason, EU through Directives,

Regulations, researches, proposals, Action Plans, Communications of European Commission, set common binding targets aiming to the protection of environment and the promotion of renewable energy sources. This had been proven at a maximum by the fact that priority in the sale of the produced energy by the electricity producers to the Market operator (mandatory pool) has the produced energy by renewable energy sources, even if this energy from RES costs more than the produced energy by conventional energy sources.

In 2003, the Directive 2003/54/EC started the liberalization of the electricity market, namely the transition from the monopoly regime to an open and competitive market. It was obvious that the liberalization of the electricity market and the abolition of the monopolies led to the entry of the privates in the electricity market through investments that brought a new dynamic in the market and contributed to the penetration of renewable energy sources in the market.

In substance, the entrance of privates in electricity market demonstrated the necessity of setting a specific procedure for granting licenses to privates to construct power plants. However, Directive 2009/28/EC (RES Directive) and Directive 2009/72/EC (Electricity Directive) set only some specific principles that Member-States must follow when they determine through national legislation the administration and licensing procedure for entry into service of RES power plants.

Thus, according to the foregoing analysis, Greece through an extensive legislation of all these years set very high targets concerning the protection of environment and determined the administration and licensing procedure for entry into service of RES power plants aiming to the promotion of RES.

At the beginning, the administration and licensing procedure was so complicated and time-consuming, with the result that privates were not able to invest on the construction of R.E.S. power plants. Today, the Law 3468/2006, after many amendments, led to the simplification and acceleration of licensing procedure and thereby, investments on the construction of R.E.S. power plants have increased rapidly. The role of the Council of State in the formation of the current Greek administration and licensing procedure was crucial.

However, the simplification and acceleration of licensing procedure may have harmful effects on the *commodity* that must be protected, *namely the environment*. For this reason, the Environment Impact Assessment of these R.E.S. power plants and Special Framework for Spatial Planning and Sustainable Development for R.E.S. are very crucial elements on licensing procedure that can contribute on the protection of environment and on the smooth integration of R.E.S. installations in Greek reality creating at the same time a safe and stable investment climate.

In conclusion, it is worth noting that the current European and Greek administration and licensing procedure for entry into service of R.E.S. power plants has been improved largely, but the reconfiguration of these procedures at European and National level is necessary, in order to be achieved the environmental targets set and attract private investors in the sector of electricity by R.E.S.

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